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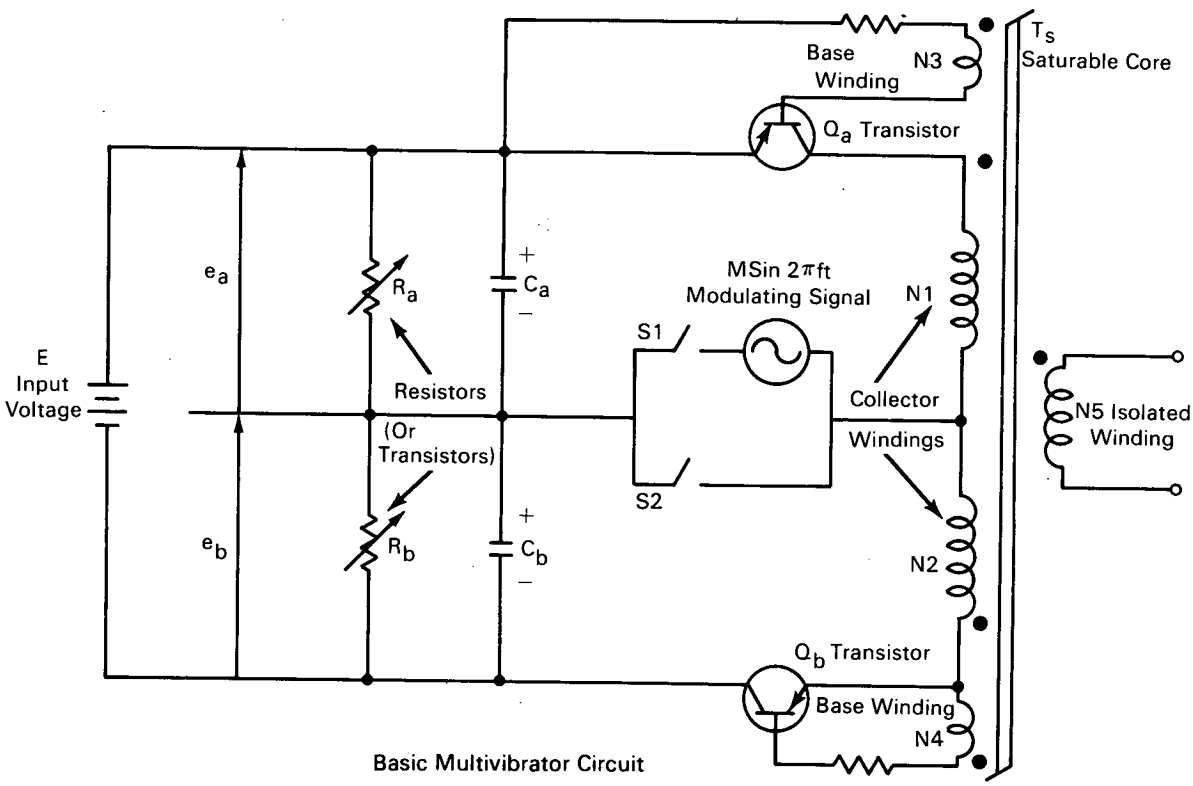
An Unconventional Magnetically-Coupled Multivibrator



Basic Multivibrator Circuit

This physically simple, highly efficient innovation should be interesting to manufacturers of electronic power supplies and voltage converters and to technical personnel working in the field of static power conversion. Two primary functions of the multivibrator are that the circuit can act as a voltage-to-duty-cycle generator for nondissipatively regulated dc to dc converters; and with slight modification, the circuit can be used as a high-frequency pulse-width modulator for controlling a dc to low-frequency sinusoidal ac inverter. In addition, the duty-cycle generator is suitable for speed control of dc motors, while the pulse-width modulator, when properly combined with other power-handling circuits, can be used as a switching-mode linear amplifier (the dc to sinusoidal ac inverter is a special case where the signal happens to be a sine wave.)

The basic multivibrator circuit, shown in the figure, provides a low-frequency sine wave output without using a low-frequency power transformer or filter

(continued overleaf)

components. The circuit utilizes two transistors and a magnetic core with a rectangular B-H characteristic, representing a reduction in complexity, size, and weight over similar units. The semiconductor and magnetic elements of the multivibrator are transistors Q_a, Q_b and a saturable core T_s. Collector windings N1 and N2 have an equal number of turns; base windings N3 and N4 are also equal. Any number of isolated windings, such as N5, can be provided for multiple outputs. The direct voltage supplying power to the two halves of the multivibrator is obtained by dividing the input voltage E into two components, e_a and e_b. The division of voltage is accomplished through C_a and C_b in parallel with R_a and R_b (either resistors or transistors); impedances can be held fixed or varied through standard control techniques. With S1 closed and S2 opened, the circuit performs the function of a voltage-to-cycle generator. With S1 opened and S2 closed and with $R_a = R_b$ and $C_a = C_b$, the circuit performs the functions of a pulse-width modulator with the sinusoidal reference M Sin 2π ft serving as a modulating signal.

Note:

Requests for further information may be directed to:
Technology Utilization Officer
Headquarters
National Aeronautics and Space Admin.
Washington, D.C. 20546
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Patent status:

No patent action is contemplated by NASA.

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